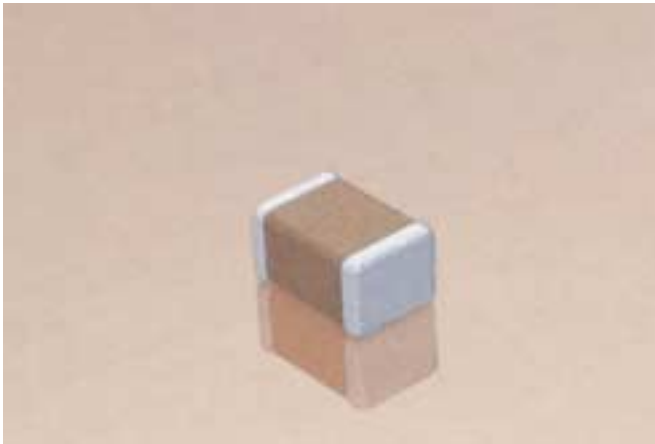


# X7R Dielectric

## General Specifications



X7R formulations are called "temperature stable" ceramics and fall into EIA Class II materials. X7R is the most popular of these intermediate dielectric constant materials. Its temperature variation of capacitance is within  $\pm 15\%$  from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . This capacitance change is non-linear.

Capacitance for X7R varies under the influence of electrical operating conditions such as voltage and frequency.

X7R dielectric chip usage covers the broad spectrum of industrial applications where known changes in capacitance due to applied voltages are acceptable.

### PART NUMBER (see page 2 for complete part number explanation)

**0805**

**Size**  
(L" x W")

**5**

**Voltage**  
6.3V = 6  
10V = Z  
16V = Y  
25V = 3  
50V = 5  
100V = 1  
200V = 2

**C**

**Dielectric**  
X7R = C

**103**

**Capacitance Code (In pF)**  
2 Sig. Digits + Number of Zeros

**M**

**Capacitance Tolerance**  
Preferred  
J =  $\pm 5\%$   
K =  $\pm 10\%$   
M =  $\pm 20\%$

**A**

**Failure Rate**  
A = Not Applicable

**T**

**Terminations**  
T = Plated Ni and Sn  
7 = Gold Plated

**2**

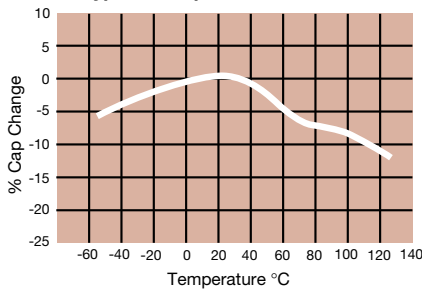
**Packaging**  
2 = 7" Reel  
4 = 13" Reel  
7 = Bulk Cass.  
9 = Bulk

**A**

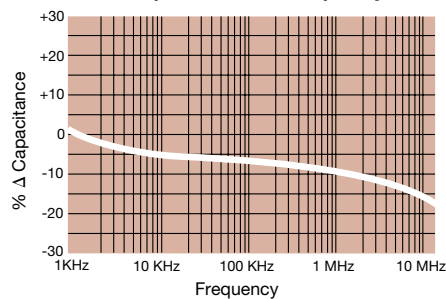
**Special Code**  
A = Std. Product

**Contact Factory For Multiples**

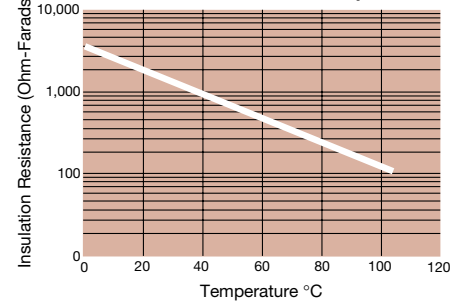
**X7R Dielectric Typical Temperature Coefficient**



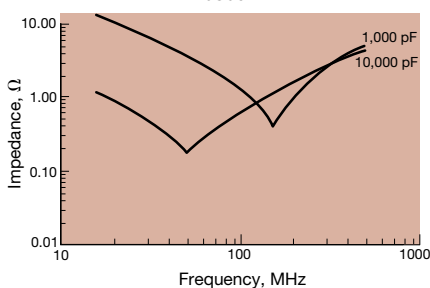
**$\Delta$  Capacitance vs. Frequency**



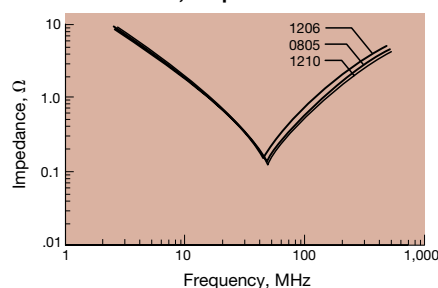
**Insulation Resistance vs Temperature**



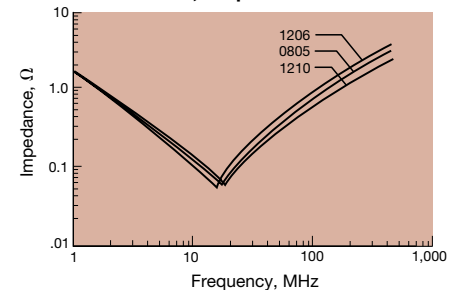
**Variation of Impedance with Cap Value Impedance vs. Frequency 1,000 pF vs. 10,000 pF - X7R 0805**



**Variation of Impedance with Chip Size Impedance vs. Frequency 10,000 pF - X7R**



**Variation of Impedance with Chip Size Impedance vs. Frequency 100,000 pF - X7R**



## Specifications and Test Methods

| Parameter/Test                        |                       | X7R Specification Limits   | Measuring Conditions  |                |
|---------------------------------------|-----------------------|--|---|----------------|
| <b>Operating Temperature Range</b>    |                       | -55°C to +125°C  | Temperature Cycle Chamber   |                |
| <b>Capacitance</b>                    |                       | Within specified tolerance   | Freq.: 1.0 kHz ± 10%<br>Voltage: 1.0Vrms ± .2V<br>For Cap > 10 µF, 0.5Vrms @ 120Hz  |                |
| <b>Dissipation Factor</b>             |                       | ≤ 2.5% for ≥ 50V DC rating<br>≤ 3.0% for 25V DC rating<br>≤ 3.5% for 16V DC rating<br>≤ 5.0% for ≤ 10V DC rating |   |                |
| <b>Insulation Resistance</b>          |                       | 100,000MΩ or 1000MΩ - µF, whichever is less  | Charge device with rated voltage for 60 ± 5 secs @ room temp/humidity   |                |
| <b>Dielectric Strength</b>            |                       | No breakdown or visual defects   | Charge device with 300% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max)   |                |
| <b>Resistance to Flexure Stresses</b> | Appearance            | No defects   | Deflection: 2mm<br>Test Time: 30 seconds<br>  |                |
|                                       | Capacitance Variation | ≤ ±12%   |   |                |
|                                       | Dissipation Factor    | Meets Initial Values (As Above)  |   |                |
|                                       | Insulation Resistance | ≥ Initial Value x 0.3  |   |                |
| <b>Solderability</b>                  |                       | ≥ 95% of each terminal should be covered with fresh solder   | Dip device in eutectic solder at 230 ± 5°C for 5.0 ± 0.5 seconds  |                |
| <b>Resistance to Solder Heat</b>      | Appearance            | No defects, <25% leaching of either end terminal   | Dip device in eutectic solder at 260°C for 60 seconds. Store at room temperature for 24 ± 2 hours before measuring electrical properties.   |                |
|                                       | Capacitance Variation | ≤ ±7.5%  |   |                |
|                                       | Dissipation Factor    | Meets Initial Values (As Above)  |   |                |
|                                       | Insulation Resistance | Meets Initial Values (As Above)  |   |                |
|                                       | Dielectric Strength   | Meets Initial Values (As Above)  |   |                |
| <b>Thermal Shock</b>                  | Appearance            | No visual defects  | Step 1: -55°C ± 2°  | 30 ± 3 minutes |
|                                       | Capacitance Variation | ≤ ±7.5%  | Step 2: Room Temp   | ≤ 3 minutes    |
|                                       | Dissipation Factor    | Meets Initial Values (As Above)  | Step 3: +125°C ± 2°   | 30 ± 3 minutes |
|                                       | Insulation Resistance | Meets Initial Values (As Above)  | Step 4: Room Temp   | ≤ 3 minutes    |
|                                       | Dielectric Strength   | Meets Initial Values (As Above)  | Repeat for 5 cycles and measure after 24 ± 2 hours at room temperature  |                |
| <b>Load Life</b>                      | Appearance            | No visual defects  | Charge device with twice rated voltage in test chamber set at 125°C ± 2°C for 1000 hours (+48, -0)<br><br>Remove from test chamber and stabilize at room temperature for 24 ± 2 hours before measuring.                                 |                |
|                                       | Capacitance Variation | ≤ ±12.5%   |   |                |
|                                       | Dissipation Factor    | ≤ Initial Value x 2.0 (See Above)  |   |                |
|                                       | Insulation Resistance | ≥ Initial Value x 0.3 (See Above)  |   |                |
|                                       | Dielectric Strength   | Meets Initial Values (As Above)  |   |                |
| <b>Load Humidity</b>                  | Appearance            | No visual defects  | Store in a test chamber set at 85°C ± 2°C/ 85% ± 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied.<br><br>Remove from chamber and stabilize at room temperature and humidity for 24 ± 2 hours before measuring. |                |
|                                       | Capacitance Variation | ≤ ±12.5%   |   |                |
|                                       | Dissipation Factor    | ≤ Initial Value x 2.0 (See Above)  |   |                |
|                                       | Insulation Resistance | ≥ Initial Value x 0.3 (See Above)  |   |                |
|                                       | Dielectric Strength   | Meets Initial Values (As Above)  |   |                |

# X7R Dielectric

## Capacitance Range



PREFERRED SIZES ARE SHADED

| SIZE         | 0201                                 |    | 0402                           |    |    |    | 0603                           |     |    |    |    |    | 0805                           |     |    |    |    |    | 1206                           |     |    |    |    |    |     |     |  |
|--------------|--------------------------------------|----|--------------------------------|----|----|----|--------------------------------|-----|----|----|----|----|--------------------------------|-----|----|----|----|----|--------------------------------|-----|----|----|----|----|-----|-----|--|
| Soldering    | Reflow Only                          |    | Reflow Only                    |    |    |    | Reflow/Wave                    |     |    |    |    |    | Reflow/Wave                    |     |    |    |    |    | Reflow/Wave                    |     |    |    |    |    |     |     |  |
| Packaging    | All Paper                            |    | All Paper                      |    |    |    | All Paper                      |     |    |    |    |    | Paper/Embossed                 |     |    |    |    |    | Paper/Embossed                 |     |    |    |    |    |     |     |  |
| (L) Length   | MM<br>0.60 ± 0.03<br>(0.024 ± 0.001) |    | 1.00 ± 0.10<br>(0.040 ± 0.004) |    |    |    | 1.60 ± 0.15<br>(0.063 ± 0.006) |     |    |    |    |    | 2.01 ± 0.20<br>(0.079 ± 0.008) |     |    |    |    |    | 3.20 ± 0.20<br>(0.126 ± 0.008) |     |    |    |    |    |     |     |  |
| (W) Width    | MM<br>0.30 ± 0.03<br>(0.011 ± 0.001) |    | 0.50 ± 0.10<br>(0.020 ± 0.004) |    |    |    | 0.81 ± 0.15<br>(0.032 ± 0.006) |     |    |    |    |    | 1.25 ± 0.20<br>(0.049 ± 0.008) |     |    |    |    |    | 1.60 ± 0.20<br>(0.063 ± 0.008) |     |    |    |    |    |     |     |  |
| (t) Terminal | MM<br>0.15 ± 0.05<br>(0.006 ± 0.002) |    | 0.25 ± 0.15<br>(0.010 ± 0.006) |    |    |    | 0.35 ± 0.15<br>(0.014 ± 0.006) |     |    |    |    |    | 0.50 ± 0.25<br>(0.020 ± 0.010) |     |    |    |    |    | 0.50 ± 0.25<br>(0.020 ± 0.010) |     |    |    |    |    |     |     |  |
| WVDC         | 10                                   | 16 | 6.3                            | 10 | 16 | 25 | 50                             | 6.3 | 10 | 16 | 25 | 50 | 100                            | 200 | 10 | 16 | 25 | 50 | 100                            | 200 | 10 | 16 | 25 | 50 | 100 | 200 |  |
| Cap (pF)     | 100                                  | A  | A                              | C  | C  | C  | C                              | C   |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 120                                  | A  | A                              | C  | C  | C  | C                              | C   |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 150                                  | A  | A                              | C  | C  | C  | C                              | C   |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 180                                  | A  | A                              | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 220                                  | A  | A                              | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 270                                  | A  | A                              | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 330                                  | A  | A                              | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 390                                  | A  | A                              | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 470                                  | A  | A                              | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 560                                  | A  | A                              | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 680                                  | A  | A                              | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 820                                  | A  | A                              | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 1000                                 | A  | A                              | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 1200                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 1500                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 1800                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 2200                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 2700                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 3300                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 3900                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 4700                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 5600                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 6800                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 8200                                 |    |                                | C  | C  | C  | C                              | C   | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
| Cap. (µF)    | 0.010                                |    |                                | C  | C  | C  | C                              |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.012                                |    |                                | C  | C  | C  | C                              |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.015                                |    |                                | C  | C  | C  | C                              |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.018                                |    |                                | C  | C  | C  |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.022                                |    |                                | C  | C  | C  |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.027                                |    |                                | C  | C  | C  |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.033                                |    |                                | C  | C  | C  |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.039                                |    |                                | C  | C  | C  |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.047                                |    |                                | C  | C  | C  |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.056                                |    |                                |    |    |    |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.068                                |    |                                |    |    |    |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.082                                |    |                                |    |    |    |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.10                                 |    |                                |    |    |    |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.12                                 |    |                                |    |    |    |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.15                                 |    |                                |    |    |    |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.18                                 |    |                                |    |    |    |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.22                                 |    |                                |    |    |    |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.27                                 |    |                                |    |    |    |                                |     | G  | G  | G  | G  | G                              | G   |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.33                                 |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.47                                 |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.56                                 |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.68                                 |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 0.82                                 |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 1.0                                  |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 1.2                                  |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 1.5                                  |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 1.8                                  |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 2.2                                  |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 3.3                                  |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 4.7                                  |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 10                                   |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 22                                   |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 47                                   |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
|              | 100                                  |    |                                |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |                                |     |    |    |    |    |     |     |  |
| WVDC         | 10                                   | 16 | 6.3                            | 10 | 16 | 25 | 50                             | 6.3 | 10 | 16 | 25 | 50 | 100                            | 200 | 10 | 16 | 25 | 50 | 100                            | 200 | 10 | 16 | 25 | 50 | 100 | 200 |  |
| SIZE         | 0201                                 |    | 0402                           |    |    |    | 0603                           |     |    |    |    |    | 0805                           |     |    |    |    |    | 1206                           |     |    |    |    |    |     |     |  |

Contact Factory for Multiples

# X7R Dielectric



## Capacitance Range

PREFERRED SIZES ARE SHADED

| SIZE           |          | 1210                           |                 |                 |                 |                 | 1812                           |                 |                 |                 | 1825                           |                 | 2220                           |                 |                 | 2225                           |     |
|----------------|----------|--------------------------------|-----------------|-----------------|-----------------|-----------------|--------------------------------|-----------------|-----------------|-----------------|--------------------------------|-----------------|--------------------------------|-----------------|-----------------|--------------------------------|-----|
| Soldering      |          | Reflow/Wave                    |                 |                 |                 |                 | Reflow Only                    |                 |                 |                 | Reflow Only                    |                 | Reflow Only                    |                 |                 | Reflow Only                    |     |
| Packaging      |          | Paper/Embossed                 |                 |                 |                 |                 | All Embossed                   |                 |                 |                 | All Embossed                   |                 | All Embossed                   |                 |                 | All Embossed                   |     |
| (L) Length     | MM (in.) | 3.20 ± 0.20<br>(0.126 ± 0.008) |                 |                 |                 |                 | 4.50 ± 0.30<br>(0.177 ± 0.012) |                 |                 |                 | 4.50 ± 0.30<br>(0.177 ± 0.012) |                 | 5.7 ± 0.40<br>(0.224 ± 0.016)  |                 |                 | 5.72 ± 0.25<br>(0.225 ± 0.010) |     |
| (W) Width      | MM (in.) | 2.50 ± 0.20<br>(0.098 ± 0.008) |                 |                 |                 |                 | 3.20 ± 0.20<br>(0.126 ± 0.008) |                 |                 |                 | 6.40 ± 0.40<br>(0.252 ± 0.016) |                 | 5.0 ± 0.40<br>(0.197 ± 0.016)  |                 |                 | 6.35 ± 0.25<br>(0.250 ± 0.010) |     |
| (t) Terminal   | MM (in.) | 0.50 ± 0.25<br>(0.020 ± 0.010) |                 |                 |                 |                 | 0.61 ± 0.36<br>(0.024 ± 0.014) |                 |                 |                 | 0.61 ± 0.36<br>(0.024 ± 0.014) |                 | 0.64 ± 0.39<br>(0.025 ± 0.015) |                 |                 | 0.64 ± 0.39<br>(0.025 ± 0.015) |     |
| WVDC           |          | 10                             | 16              | 25              | 50              | 100             | 16                             | 25              | 50              | 100             | 50                             | 100             | 50                             | 100             | 200             | 50                             | 100 |
| Cap (pF)       | 100      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 120      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 150      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 180      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 220      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 270      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 330      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 390      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 470      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 560      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 680      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 820      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 1000     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 1200     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 1500     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 1800     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 2200     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 2700     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 3300     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 3900     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 4700     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 5600     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 6800     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 8200     | J                              | J               | J               | J               | J               |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
| Cap. (µF)      | 0.010    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.012    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.015    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.018    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.022    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.027    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.033    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.039    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.047    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.056    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.068    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.082    | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.10     | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.12     | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.15     | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.18     | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.22     | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.27     | J                              | J               | J               | J               | J               |                                |                 | K               | K               | M                              | M               | X                              | X               | X               | M                              | M   |
|                | 0.33     | J                              | J               | J               | J               | J               |                                |                 | K               | M               | M                              | M               | X                              | X               |                 | M                              | M   |
|                | 0.47     | M                              | M               | M               | M               | M               |                                |                 | K               | P               | M                              | M               | X                              | X               |                 | M                              | M   |
|                | 0.56     | M                              | M               | M               | M               | M               |                                |                 | M               | Q               | M                              | M               | X                              | X               |                 | M                              | M   |
|                | 0.68     | M                              | M               | P               |                 |                 |                                |                 | M               | X               | M                              | Q               | X                              | X               |                 | M                              | M   |
|                | 0.82     | M                              | M               | P               |                 |                 |                                |                 | M               | X               | M                              | Q               | X                              | X               |                 | M                              | M   |
|                | 1.0      | N                              | N               | P               |                 |                 |                                |                 | M               | X               | M                              | Q               | X                              | X               |                 | M                              | M   |
|                | 1.2      | N                              | N               |                 |                 |                 |                                |                 | M               |                 |                                |                 | X                              |                 |                 | M                              | P   |
|                | 1.5      | N                              | N               |                 |                 |                 |                                |                 | M               |                 |                                |                 |                                |                 |                 | M                              | P   |
|                | 1.8      | N                              | N               | P               |                 |                 |                                |                 | M               |                 |                                |                 |                                |                 |                 | M                              | P   |
|                | 2.2      |                                |                 | X               |                 |                 |                                |                 |                 |                 |                                |                 |                                | Z               |                 | M                              |     |
|                | 3.3      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 4.7      | Q                              | Z               |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 10       |                                |                 |                 |                 |                 |                                | Z               |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 22       |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 47       |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
|                | 100      |                                |                 |                 |                 |                 |                                |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |
| WVDC           |          | 10                             | 16              | 25              | 50              | 100             | 16                             | 25              | 50              | 100             | 50                             | 100             | 50                             | 100             | 200             | 50                             | 100 |
| SIZE           |          | 1210                           |                 |                 |                 |                 | 1812                           |                 |                 |                 | 1825                           |                 | 2220                           |                 |                 | 2225                           |     |
| Letter         |          | A                              | C               | E               | G               | J               | K                              | M               | N               | P               | Q                              | X               | Y                              | Z               | BB              | CC                             |     |
| Max. Thickness |          | 0.33<br>(0.013)                | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.86<br>(0.034) | 0.94<br>(0.037) | 1.02<br>(0.040)                | 1.27<br>(0.050) | 1.40<br>(0.055) | 1.52<br>(0.060) | 1.78<br>(0.070)                | 2.29<br>(0.090) | 2.54<br>(0.100)                | 2.79<br>(0.110) | 3.05<br>(0.120) | 3.175<br>(0.125)               |     |
|                |          | PAPER                          |                 |                 |                 |                 | EMBOSS                         |                 |                 |                 |                                |                 |                                |                 |                 |                                |     |

Contact Factory for Multiples

